18. USING SEEDLING TRAYS AS EXTENSION AIDS IN AN ACIAR PROJECT IN LEYTE, THE PHILIPPINES

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As part of ACIAR project ASEM/2003/052, *Improving Financial Returns to Smallholder Tree Farmers in the Philippines* in Leyte Province, the Philippines, 50 cell seedling trays are proposed as an extension aid to promote the uptake and diffusion of agro-forestry. The 50 cell trays were designed in Queensland, Australia and prevent root coiling while promoting air pruning of roots. The trays are a substantial improvement over the traditional polythene bag which is widely used in Australia and the Philippines to grow seedlings. Use of the trays is proposed as an extension aid in the provision of assistance to individual Filipino farmers. Evaluation of their use will be undertaken using a constructivist methodology to determine impediments to the uptake of tree farming from a farmer's perspective.

INTRODUCTION

Following the deforestation of Leyte Province over the last 50 years, the timber industry has largely collapsed. Despite interest in plantation grown trees, principally *Gmelina arborea, Acacia mangium* and *Swietenia macrophylla* a recent survey found that the median age of the plantations was 10 years, near to their harvest age. There are many smallholder tree farmers in Leyte who planted trees some years ago and are now looking for to sell their trees. The survey found very few young plantations. Part of the problem may lie with the poor silviculture being applied to the tree farms and subsequent poor tree growth. A radical intervention is required to assist farmers to grow better trees and to market those that they have.

Improving the productivity of tree farms is one of the aims of ACIAR project ASEM/2003/052 *Improving Financial Returns to Smallholder Tree Farmers in the Philippines*. Farmers will be assisted to produce greater volumes of timber per unit of cost. The growth rate of trees must be maximised and one of the first steps in ensuring this is to plant seedlings which have a healthy well-formed root system. In addition, the trees must be planted in a way that minimizes planting shock and consequent interruption to their growth.

Paradoxically, although Filipino farmers are skilled in the art of growing and raising a wide variety of crops, their nursery practices produce tree seedlings that are sometimes malformed and unlikely to produce the full growth potential of the trees. This may be partly because of a lack of training or because the main 'tree' species in Leyte, coconuts, sugar cane and abaca have a root system without the central tap-root of trees. Other crops are rice or vegetables where long-term growth is not an issue. The problem is that trees are propagated in polythene bags and these tend to produce low quality seedlings, particularly when the seedlings are grown with the bags in contact with the ground. In addition, from observation in nurseries, poor dibbling practices are also resulting in malformed seedlings.

This paper begins with a discussion of the problems in nurseries in Leyte and the need for training and extension work to address the problem. Succeeding sections describe how seedling trays may be used as part of an extension approach which aims to improve nursery practices. One-to-one technical assistance and the provision of 'micro' nurseries to farmers to illustrate correct procedures is proposed. Finally, a case-by-case evaluation is suggested

as the best means of evaluating the acceptance of the micro-nurseries by farmers and their effectiveness as a tool for improving the growth of trees.

THE BACKGROUND TO NURSERY PROBLEMS IN LEYTE

Nursery procedures are well documented in the literature and are comparable for situations as dissimilar as industrial plantations in the Philippines (Williamson 1993), small-scale balsa nurseries in Papua New Guinea (Howcroft 2002) and Australian trees for agro-forestry (Doran 1990). According to Kremer (1990), the greatest problem with seedlings in containers, compared to open-root seedlings, is that the roots tend to circle around the container's wall and form a dense root ball. If the roots are not teased out, placed vertically and (maybe) pruned at planting, they may continue to grow in a circle. This causes the tree to be stunted by strangulation with its own root system or allows the tree to be uprooted by strong winds. To counter this, Doran (1990) recommends 'trainer pots' which are rectangular in cross section and have vertical ribs inside the pot. The ribs direct the roots down to the base of the pot. The roots are 'air pruned' at the base of the pot, provided that the pots have adequate aeration underneath (Venning, 1988). If the root system of the seedling is coiled or matted, the roots may be teased out or pruned, although this puts the seedling into a state of temporary shock.

A second problem is that, from observation, some of the seedlings grown in community or home nurseries have deformed stems. 'Dibbling' is the process of transplanting seedlings from a germination tray into a pot or bag where they are allowed to develop. Nursery guides stress the importance of carefully dibbling seedlings into containers so as to keep the seedling stem straight (QFRI 2002), otherwise the seedling is likely to grow with a bent stem. Planting guidelines also stress the importance of planting seedlings so that tap roots are not bent or upturned to cause 'J' rooting leading to the strangulation described above (Brown and Hall 1968; DPI Forestry 1996). J rooting is sometimes described as a "time bomb" in terms of tree growth as the effects of it may not become apparent until years later.

Finally, from visual observation in nurseries in Leyte, seedlings are often allowed to grow with the pot placed in contact with the ground. The seedlings grow roots through the bottom of the polythene bag into the ground. These roots are torn off when the seedling is removed for planting out in the field and the seedling is consequently shocked before it grows new roots. Planting old seedlings which have an overdeveloped root system, is also likely to result in a reduced growth rate.

A recent comparison in Leyte of the effectiveness of Hyco® seedling trays and polythene bags (Cedamon *et al.* 2004) found that root coiling was avoided by use of the trays and that J rooting in both trays and bags was caused by poor dibbling practices. However, this experiment has now finished and no further extension work is planned to bring these results to the farming community.

THE NEED FOR TRAINING AND EXTENSION WORK TO IMPROVE THE QUALITY OF SEEDLINGS

To fulfill the aim of growing larger volumes of timber in Leyte, farmers need training in nursery management, particularly the techniques of avoiding root coiling, J rooting and bent stems, as described above. The problem is now one of extension rather than research. While the ready availability of polythene bags (Howcroft 2002) will always ensure that they are the main container used for propagation, an alternative product such as the Hyco® seedling trays would be a useful extension tool.

The main five problems may be summarized as:

- root coiling is caused by seedlings growing too long in polythene bags
- j rooting is caused by poor dibbling, or planting seedlings with root coiling so that the roots are balled or pointing upwards
- deformed stems are caused by poor dibbling
- seedlings are often placed on (or in) the ground so that roots grow out of the pots into the ground and are broken off at out-planting
- seedlings are kept too long before out-planting.

The first problem can be remedied by education but it is a difficult decision for poor farmers to throw out seedlings which have been in the pot too long. The author recently visited the Conalum community nursery and observed old and pot bound mahogany seedlings for sale. Healthy seedlings were priced at 5 pesos while the old seedlings were priced at 2 pesos to clear the old stock. The permanent reduction in tree growth through using pot bound seedlings is well known but it is difficult to induce farmers to discard them.

The problems of J-rooting and deformed stems lend themselves to simple field demonstrations of dibbling practice. Dibbling is a simple skill and once people know what to avoid, such as the tap-root pointing upwards, or damaging the newly grown leaves, a high production rate of dibbled seedlings is possible. Dibbling is also a useful practical activity on extension days to break up a 'talk and listen' session.

Root coiling is best demonstrated by a comparison between coiled and uncoiled root systems and the pots that they grew in. Figure 1 shows various severity levels of root coiling and J rooting in seedlings grown in polythene bags. The polythene bags can be contrasted with the high density polyethylene Hyco® seedling trays which are durable, recyclable and easy to clean. There are 40 seedling cavities per tray and each has vertical training ribs which guides the roots down to the bottom of the cavity where they are air pruned. Cell volume is less than 100 ml (Cedamon et al. 2004).

Figure 1. Three examples of root coiling (left) and J rooting and stem deformation (right) in mahogany seedlings grown in a polythene bag.

A better design is available in the Queensland Native Tube (QNT) tray. This tray contains 50 cells and each has its own removable pot which slides into the cell. In addition to having vertical ribs, the cells are rectangular and the opening at the base is wider than the Hyco® pots at 40 mm square. The volume of each pot is approximately 275 ml, which is less than the standard polythene bag volume of 425 ml. Interestingly, Williamson (1993) recommended pots of 50 ml volume in the Philippines, but this is for industrial plantations where planting may be scheduled in advance.

The QNT trays come with a clip-on base which separates the tray from the ground by approximately 25 mm. This provides excellent air flow underneath the tray. In Australia, the trays cost approximately $14 each including GST. This is relatively expensive, but the price reduces dramatically with large orders. The clip-on base provides a solution to the fourth problem observed in nurseries in Leyte, where most nurseries allow seedling roots to grow out of the tube into the ground.

There is a need for an extension approach which demonstrates the best features of the QNT trays but which acknowledges that polythene bags will be in use as long as the QNT and Hyco® trays have a comparative cost disadvantage. The extension approach must also include a demonstration of planting techniques. Farmers must also be shown how they can grow seedlings in polythene bags of similar quality to seedlings produced in Hyco® or QNT seedling trays.

AN EXTENSION APPROACH TO FACILITATE IMPROVED SEEDLING PRODUCTION

The planned extension activity has two main objectives. The first objective is to increase the uptake of tree growing in Leyte and the second is to improve the nursery practices of farmers who are already raising their own seedlings.

The opportunity to showcase QNT trays to groups of farmers will arise during bus tours to demonstration sites which have been chosen to illustrate silvicultural techniques. The demonstration sites and the bus tours are described in a separate paper. For each tour, a lunch time stop has been chosen as an opportunity for the representative of the Department of Environment and Natural Resources (DENR) to talk to farmers about issues such as tree registration. As an alternative ‘hands on’ activity, a demonstration of the QNT pots and dibbling practice will publicize the advantages of the QNT pots and how to manage the disadvantages of polythene bags.

Group activities do not suit all personality types and the tours inevitably will be seen as a ‘top down’ extension method, where the science of silviculture is delivered by a group of experts. This traditional model is virtually a teaching model and has been supplanted by the other models such as ‘farmer first’ which treats the farmer as the starting point and involves an extension officer working ‘one to one’ with a farmer to improve farming practices. The farmer first model follows a more constructivist approach in that farmers are empowered to make their own choices and experiment and make deductions of their own (Maroske 1997).

A more common extension method in recent years in Australia has been participatory action learning in which the extension officer is a facilitator of co-operative action between key stakeholders. Although this style of extension is often used by small non-government organizations (Ban and Hawkins 1996), it has not been chosen in this instance because of the hierarchical culture in Filipino society which Ban and Hawkins consider makes a participatory approach more difficult to implement. Also, the logistics of creating and managing groups of farmers to achieve consensus research is not a practical research methodology for this project.

In Australia, several authors also counsel against treating farmers as a homogenous group, capable of changing their behaviour in appropriate circumstances. Russell *et al.* (1989) describe the agricultural community as a complex mixture of individual producers, farm families and community groups. Schrapnel (2001), concluded that the failure of the Australian Landare program to attract a large proportion of the Australian farming public is partly due to a range of personality types within the farming community. A preponderance of her sample of Queensland farmers had personality types which do not respond to recommendations for change – and Landcare is an advocate of (conservation-minded) change to farming practices.

Carson (1978), described the Filipino character as having elements of a homogenous culture relating back to pre-Spanish times which includes kinship, social class and economic behaviour. Some traditional values may not be helpful to the introduction of new or improved technology. These are the pressure to 'be a good sport' and 'go with the gang,' which stifles initiative and is accompanied by the fatalistic expression 'who cares' dismissing personal responsibility. On the positive side, there is the Filipino capacity for friendship, and the enjoyment of human relationships. Carson considered these to be strengths that can be exploited to achieve positive extension outcomes.

Carson also referred to the mixture of two opposing lifestyles in Filipino society. He used the division of society into *Gemeinschaft* as defined by the German sociologist Tonnies (Truzzi 1971) as being typified by tradition, authority, the importance of the group rather than the individual and the acceptance of fate rather than the demand to remake the world. Farmers who live with poverty and corruption and who belong to the *Gemeinschaft* group often suffer from an 'external locus of control' or a belief that they have little control over what happens to them or a capacity to change their fate (Callan *et al.* 1991). In contrast, a *Gesellschaft* society (which one joins rather than being born into), is exemplified in western societies as industrialised, rationalistic and impersonal and stressing efficiency, individualism and future planning.

An external locus of control and *Gemeinschaft* attitude to life is manifested by the 'wait and see' attitude of many Filipino farmers where they want clear indications that new technology will work for them before they are prepared to adopt it. This view is supported by Hayami *et al.* (1978), who note that in the traditional Filipino village, because of tradition, kinship and the need for cooperation, a high degree of interaction exists in the village and the choices of individual villagers are constrained by the choices of other villagers.

These observations suggest that a 'one to one' farmer-first extension method will be required for some farmers, particularly poorer farmers. There will be little leeway in family farm finances for expenditure on tree farming and the provision of a seed tray and seed may be an essential first step to start these farmers growing trees. The extension approach will include selecting interested farmers in a community and giving them QNT trays, seed and backup advice as required. Most of the trays will be donated to farmers who participate in tours of the demonstration sites. In an effort to reach farmers who may not be able to attend the tours, a number of the trays and seed will be targeted at farmers who express interest in tree farming but are not able to attend the tours for some reason. The strategy for donating QNT trays will therefore be deliberately inclusive of as many farmers in the community as possible. The main criteria will be that a farmer expresses interest in growing trees and has the available land to do so.

Apart from the investment in seedling trays and seed, the main financial commitment will be in the provision of an extension officer and transport to move too and from the community. This may require the commitment of an extension officer's salary for one year for 50% of their time, with the transport being additional.

EVALUATION OF THE EFFECTIVENESS OF THE QNT TRAYS AS AN EXTENSION TOOL

Conceptually, evaluation of the seedling trays will follow Bennett's(1975) hierarchy for evaluation of an extension program. This hierarchy uses seven criteria, namely:

- inputs
- activities
- people involvement
- reactions
- changes to knowledge, skills, attitudes and aspirations
- practice change and
- end results.

The farmers' reaction to the offer of seed and a seed tray is likely to be positive, at least initially. More critical will be changes to the skills of the farmers and how they use the trays. Attitudes and aspirations are more difficult to evaluate. Bawden (1990) and Pope and Denicolo (1990) both use Kelly's *personal construct theory* to influence their management of action research programs. In this theory, Kelly (1955) suggested that people make sense of the world as they experience it, forming and testing hypotheses about it and forming personal *constructs.* By the time people reach maturity, the constructs form their personality and these constructs indicate how we are likely to *construe* the world. This is similar to the work of Ernst von Glaserfeld (1994), who proposed that students (read here farmers), in the process of constructing a viable interpretation of experience may construct knowledge of a 'real' world that is different to the teacher's (extension agent's). The value of this concept is that von Glaserfeld proposed that language frequently creates the illusion that ideas and concepts are transported from a speaker to a learner and this may not be the case. In this case, the extension officer will have to dig deeper into the understanding of the farmer to perceive how he construes the world.

To Kelly and Glaserfeld what we do in this world depends on how we perceive it - and by extension, a farmer's perception of the world is likely to be very different from that of a project worker. Guba and Lincoln (1989) rejected evaluation based on 'positivist' principles, i.e. evaluation based on reductionist scientific values. They suggested that a *responsive constructivist* evaluation technique is required in which the evaluation is responsive in that it seeks out stakeholder views and responds to them in the collection of information. The evaluation is constructivist in that it accepts that the stakeholder may have different perceptions of reality to the program worker and that these realities need to be taken into account.

Practically speaking, acceptance of a constructivist evaluation requires that extension officers must spend a considerable amount of time with their clients to document their view of the world. The evaluation of this part of the project will use a case study approach which the extension officer completes with each farmer. Each farmer will represent a separate mini case study. The case study will contain as much information as the farmer is comfortable with, concerned with the farmer's attitudes and aspirations concerning tree farming and where it fits in with the farming system. Personal information will not be collected except as it relates to the motivation of the farmer to plant trees. The case study will be an open and shared document between the farmer and extension officer, although summary information will be collated for research purposes. Information from the case studies will be collated and used as a guide for further extension work.

DISCUSSION AND CONCLUSION

In its first iteration, the action research program outlined in this paper will require 50 seedling trays, seed and the services of an extension officer for a year, using approximately half of his or her work time. Establishing a rapport with farmers will be time-consuming, but as so often happens with personal relationships, once rapport is established, progress will be made.

There are some research outcomes which the project must avoid. One of these outcomes was illustrated by a visit the author recently made to another project site. When the farmers were asked about the trees the project had helped them to grow, their response was very positive. When one researcher asked the farmers why they had stopped maintaining the trees, the answer was because the project had stopped paying them to do so. Similarly, it would be simple for this project to ensure that farmers planted trees, but it may be more difficult to get trees incorporated into their farming systems.

Previous project work has established that a number of farmers in Leyte have planted trees and that often farmers would like to plant more. However, tree farming and sawmilling in Leyte is on the verge of collapse. An intervention such as is proposed above, is relatively expensive in terms of materials and labour. However, it will have two benefits. Firstly, it will begin the large task of supplying extension assistance to receptive farmers. Secondly, it will provide an increasing amount of information about the circumstances in which farmers are prepared to plant trees. The focus of the project can then move from basic silvicultural advice to more complex issues such as marketing and value-adding.

REFERENCES

Bennett, C. (1975), 'Up the Hierarchy', *Journal of Extension*, March/April 1975, available from http://www.joe.org.joe/1975march/1975-2a1pdf, accessed 9 March 2005.

Brown, A. and Hall, A. (1968), *Growing Trees on Australian Farms*, Commonwealth of Australia, Government Printer, Canberra.

Callan, V.J., Gallois, C., Noller, P. and Kashima, Y. (1991), *Social Psychology*, Second Edition, Harcourt Brace Jovanovich Publishers, Sydney.

Carson, A.L. (1978), *The Story of Philippine Educatio*', New Day Publishers, Quezon City.

Cedamon, E.D., Mangaoang, E.O., Gregorio, N.O., Pasa, A.E. and Herbohn, J.L. (2004), 'Nursery Management in Relation to Root Deformation Sowing and Shading', paper delivered to ACIAR ASEM/2000/088 *Redevelopment of a Timber Industry Following Extensive Land Clearing* end of project workshop at Ormoc, The Philippines,19-21 August 2004, pp. 1-5.

Crane, W.J.B. (1990), 'Planting of Trees', in *Trees for Rural Australia*, Cremer, K.W. (ed.), Inkata Press, Melbourne.

Doran, J.C. (1990), 'Nursery Practice', in *Trees for Rural Australia*, Cremer, K.W. (ed.), Inkata Press, Melbourne.

DPI Forestry (1997), 'Exotic Pine Silviculture Manual Vol. 4', Brisbane.

Guba, E.G. and Lincoln, Y.S. (1989), *Fourth Generation Evaluation*, Sage Publications, London.

Hayami, Y., Kikuchi, M., Moya, P.F., Bambo, L.M. and Marciano, E.B. (1978), 'Anatomy of a Peasant Economy: A Rice Village in the Philippines', International Rice Research Institute, Los Baños, Laguna.

Howcroft, N.H.S. (2002), 'The Balsa Manual: Techniques for establishment and management of Balsa (Ochroma lagopus) Plantations in Papua New Guinea', ITTO East New Britain Balsa Industry Strengthening Project PD 7/99 Rev. 2(F), Kerevat, Papua New Guinea.

Kelly, G.A. (1955), 'The Psychology of Personal Constructs', Vol. 1. *A Theory of Personality*, Norton, New York.

Maroske, (1997), 'A Model for Extension of Dairy Farmer Discussion Groups Compared to "Farmer First" and "Transfer of Technology" Models', *From the Field – Extension in Practice, Rural Extension Centre*, Gatton, pp. 60-65.

Russell, D.B., Ison, R.L., Gamble, D.R. and Williams, R.K. (1989), 'A Critical Review of Rural Extension Theory and Practice', Australian Wool Corporation.

Venning, (1988), *Growing Trees for Farms, Parks and Roadsides; A Revegetation Manual for Australia,* Lothian Publishing Company, Melbourne.

QFRI (2002), 'A Guide to Establishing Hardwoods Plantations: for Landholders in the 700 to 1000mm Rainfall Zone of South East Queensland', *Planted Forestry Information Kit*, Compact Disc, Department of Natural Resources and Mines, Brisbane, pp. 4-5.

Schrapnel, M.A. (2001), Bushies and Cockies – Beyond the Myths: the Personalities of our Outback Land Managers, thesis submitted for the degree of Master of Philosophy, University of Queensland, Brisbane, pp. 17-18.

Truzzi, M. (1971), *Sociology: The Classic Statements*, Oxford University Press, New York.

Van den Ban, A.W. and Hawkins, H.S. (1996), *Agricultural Extension*, Second Edition, Blackwell Science Ltd, Oxford.

Williamson, M. (1993), 'Forest Management in Industrial Forest Plantations in the Philippines', Fortech Forestry Technical Services Pty. Ltd. Canberra.